

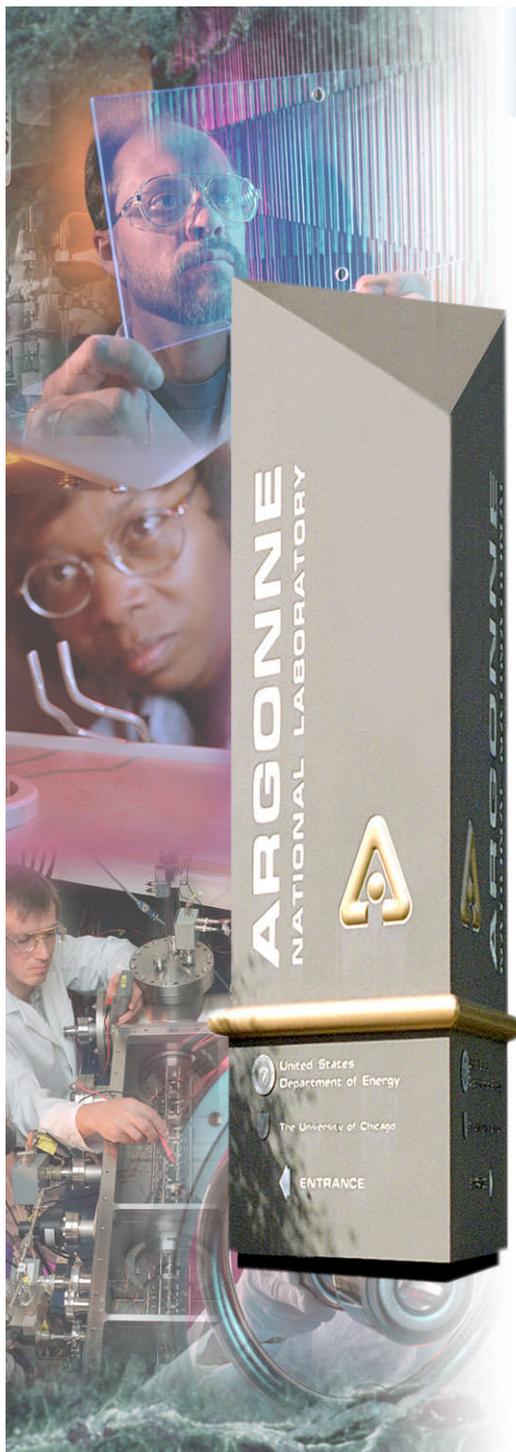
# Argonne National Laboratory Small-Angle Scattering Discussion Group

*Small-angle scattering is the premier technique  
for the size characterization of nanoscale objects.*

*Pete R. Jemian  
APS/Users Ops Monthly Meeting, 18 January 2006*



*Argonne National Laboratory is managed by  
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## ***Mission Statement***

The Small-Angle Scattering special interest group at Argonne National Laboratory has been created to promote awareness of the small-angle scattering facilities at the APS, IPNS, and elsewhere on the ANL campus and to foster communications between the various research groups.

Through this group, we believe we can build a strong user community for small-angle scattering at the APS, IPNS, and throughout ANL.

## *Guiding Principles*

- **C**ooperation

- **C**ollaboration

- **C**orrelation

- **C**alibration

- **C**how (**c**holesterol)

## *Communications*

- Membership
  - open to all
- Email list server
  - **small-angle@aps.anl.gov**
  - hosted by APS
- Monthly meetings
  - (usually) first Tuesday of each month, noon, 438C
- WWW site
  - <http://small-angle.aps.anl.gov>
  - hosted by UNICAT

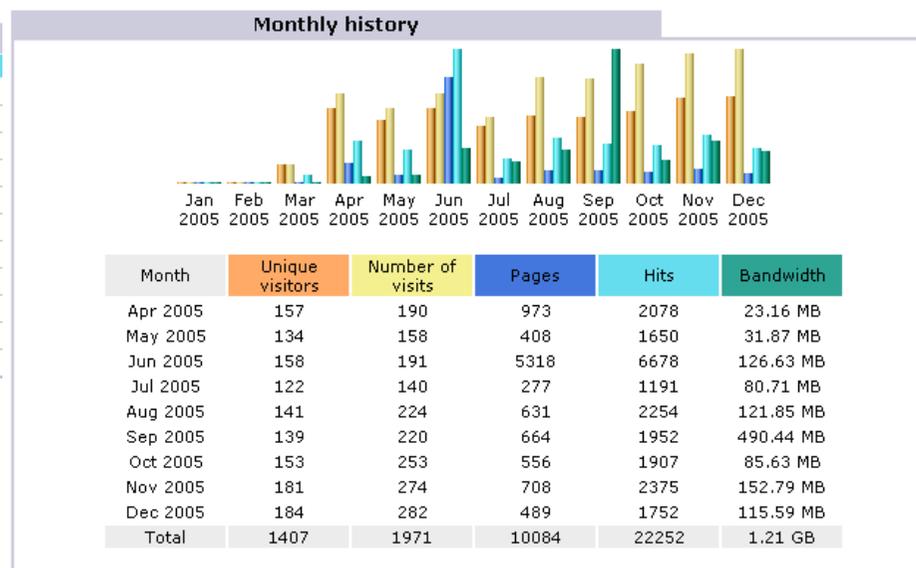
## small-angle.aps.anl.gov WWW site

### ■ Example WWW traffic summary from December 2005

Summary					
<b>Reported period</b>	Month Dec 2005				
<b>First visit</b>	01 Dec 2005 - 06:00				
<b>Last visit</b>	31 Dec 2005 - 10:22				
	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Viewed traffic *	184	282 (1.53 visits/visitor)	489 (1.73 pages/visit)	1752 (6.21 hits/visit)	115.59 MB (419.72 KB/visit)
Not viewed traffic *			11117	11355	268.21 MB

\* Not viewed traffic includes traffic generated by robots, worms, or replies with special HTTP status codes.

Visitors domains/countries (Top 10) -				
	Domains/Countries		Pages	Hits
gov	USA Government	gov	134	318
org	Non-Profit Organizations	org	116	209
com	Commercial	com	63	147
Unknown	Unknown	ip	61	268
net	Network	net	39	286
edu	USA Educational	edu	20	120
de	Germany	de	7	65
jp	Japan	jp	5	43
tw	Taiwan	tw	4	22
uk	United Kingdom	uk	3	32
	Others		37	242



## Organizational Information

- What is the group?
  - *ad hoc* discussion of small-angle scattering – very informal
- How was group formed?
  - After years of incubating the idea of a focus group, a core group met and decided on a format. (Jemian, Thiyagarajan, Irving, Ilavsky, Quintana, Cookson)
  - First meeting was 27 June 2002, ~ monthly since then
- Who usually shows up?
  - APS & IPNS instrument scientists
  - Users (from ANL and off-site, as well)
  - Attendance averages ~25/meeting, not just APS
- Meeting content
  - Update about upcoming conferences and deadlines
  - 80% scientific/technical presentations by
    - *Visiting researchers*
    - *Local researchers*
    - *Instrument scientists*
  - 20% round-table discussions

## *Lessons Learned*

- Informality
  - promotes useful interaction
- Consistency
  - regular meeting time and place is very important
- Science talks are good
  - ... *BUT* ...
- Occasional discussion-only meetings are essential
- Free lunch will draw a crowd
  - UNICAT and DND-CAT have been primary sponsors (non-DOE funding sources)
  - Initial idea that “*Group that presents will sponsor lunch*” did not work

## *Summary of Achievements*

- Glassy carbon absolute intensity standard
- WWW site ([small-angle.aps.anl.gov](http://small-angle.aps.anl.gov))
  - One-stop source of information for small-angle users
- e-mail listserv ([small-angle@aps.anl.gov](mailto:small-angle@aps.anl.gov))
  - Instant access to discussion group
- education
  - data evaluation methods
  - basic principles
  - instrumental design principles
  - group awareness of other facilities at ANL
  - example for other special interest groups
- fostered collaboration & communications
- workshop at 2004 APS Users Meeting
- facilities poster at 2005 ACS National Meeting
- dozens of pizzas consumed

## Recent Presentations

- Lixin Fan , XFD-XMG, *Small-Angle Fluctuation X-ray Microscopy: A Novel Approach for Measuring Medium-Range Order*
- Alec Sandy, APS/IMM-XOR, *Small-Angle XPCS at 8-ID*
- Byeongdu Lee, APS, *Analysis concepts implemented in the GISAXS software*
- Xuefa Li, APS, *Developing A Dedicated Grazing-Incidence Small-Angle X-ray Scattering Beamline at the APS*
- group discussion
- Pete R. Jemian, UNICAT, *Regularization Methods for Particle Size Distributions from Small-Angle Scattering*
- Andrew J. Goshe, CNM, *Solution Structural Analysis of Supramolecular Assemblies by SAXS/WAXS*
- Andrew J. Allen, Ceramics Division, NIST
- Kristin Brinker, Northwestern University, *Rheology and Flow-Induced Structure in a Polystyrene-Polyisoprene Bicontinuous Microemulsion*
- Ray Osborn, IPNS, *NeXus for data storage*

# 2005 ACS National Meeting Facilities Poster



## THE SMALL-ANGLE SCATTERING INSTRUMENTS AT ARGONNE NATIONAL LABORATORY



2005 National Meeting of the American Chemical Society, Washington, DC, August 28 – September 1, 2005

presented by **Pete R. Jemian, jemian@anl.gov**  
 Argonne National Laboratory Small-Angle Scattering Group  
 Argonne National Laboratory, Argonne, IL 60439

<http://small-angle.aps.anl.gov>

**ABSTRACT:** Small-angle scattering is the premier technique for the size characterization of nanoscale objects. Twelve different instruments for measuring small-angle scattering (SAXS and SANS) are available from the Scientific User Facilities at Argonne National Laboratory, including the Advanced Photon Source and the Intense Pulsed Neutron Source. The combined capabilities of these instruments span a broad range of reciprocal space and wavelength allowing for investigations from many disciplines of science including materials science, chemistry, environmental science, biology, medicine, and physics.

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### IPNS: SAND and SASI

**Instrument Description:** SAND and SASI are the only instruments at IPNS that use a 2D detector. SAND is a neutron scattering instrument and SASI is a synchrotron X-ray scattering instrument. Both instruments are designed for high-resolution scattering experiments.

**Instrument Parameters:**

- Wavelength: 0.15 - 0.25 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D CCD
- Resolution: 0.1 nm

### APB 18M: GIBAX/Reflectivity

**Instrument Description:** GIBAX is a grazing incidence X-ray scattering instrument used for studying thin films and layered structures. Reflectivity is used to study the electron density profile of the sample.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 1D
- Resolution: 0.1 nm

### APB 14D: High-Energy SAXS/WAXS

**Instrument Description:** High-energy SAXS/WAXS is used for studying the structure of materials at high resolution. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.05 - 0.1 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### APB 06D: Materials and Polymer Science

**Instrument Description:** APB 06D is a neutron scattering instrument used for studying the structure of materials and polymers. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### APB 33D: URAXS, AURAXS, UXASX Imaging

**Instrument Description:** URAXS, AURAXS, and UXASX are used for studying the structure of materials and polymers. They are particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### IPNS

**Instrument Description:** IPNS is a neutron scattering instrument used for studying the structure of materials and polymers. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### IPNS

**Instrument Description:** IPNS is a neutron scattering instrument used for studying the structure of materials and polymers. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### APB 8D: X-Ray Photon Correlation Spectroscopy (XPCS) and GIBAXS

**Instrument Description:** XPCS and GIBAXS are used for studying the structure of materials and polymers. They are particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### APS 15D: SAXS from biological solutions

**Instrument Description:** APS 15D is a synchrotron X-ray scattering instrument used for studying the structure of biological solutions. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### ChemMatCARS 15D: SAXS/WAXS

**Instrument Description:** ChemMatCARS 15D is a synchrotron X-ray scattering instrument used for studying the structure of materials and polymers. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### APS 12D: SAXS/WAXS, GIBAXS, Time-resolved SAXS

**Instrument Description:** APS 12D is a synchrotron X-ray scattering instrument used for studying the structure of materials and polymers. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

### APS 9D: SAXS/SAXS/WAXS

**Instrument Description:** APS 9D is a synchrotron X-ray scattering instrument used for studying the structure of materials and polymers. It is particularly useful for studying nanoscale structures.

**Instrument Parameters:**

- Wavelength: 0.1 - 0.2 nm
- Beam size: 0.5 mm x 0.5 mm
- Detector: 2D
- Resolution: 0.1 nm

ACKNOWLEDGEMENT: Argonne National Laboratory is supported by the U.S. DOE, Basic Energy Sciences, Office of Science under contract No. W-31-109-ENG-38.

## *Future Directions*

- Outreach
  - Introduction to small-angle scattering WWW page
- Collaborations
  - Data analysis software
  - Round-robin evaluations
- Standardization
  - More absolute intensity standards
  - sample holders, cells, and environments
- Discussions
  - standardization of data format
  - common window materials
- Life after pizza
  - Need to improve the bottom line